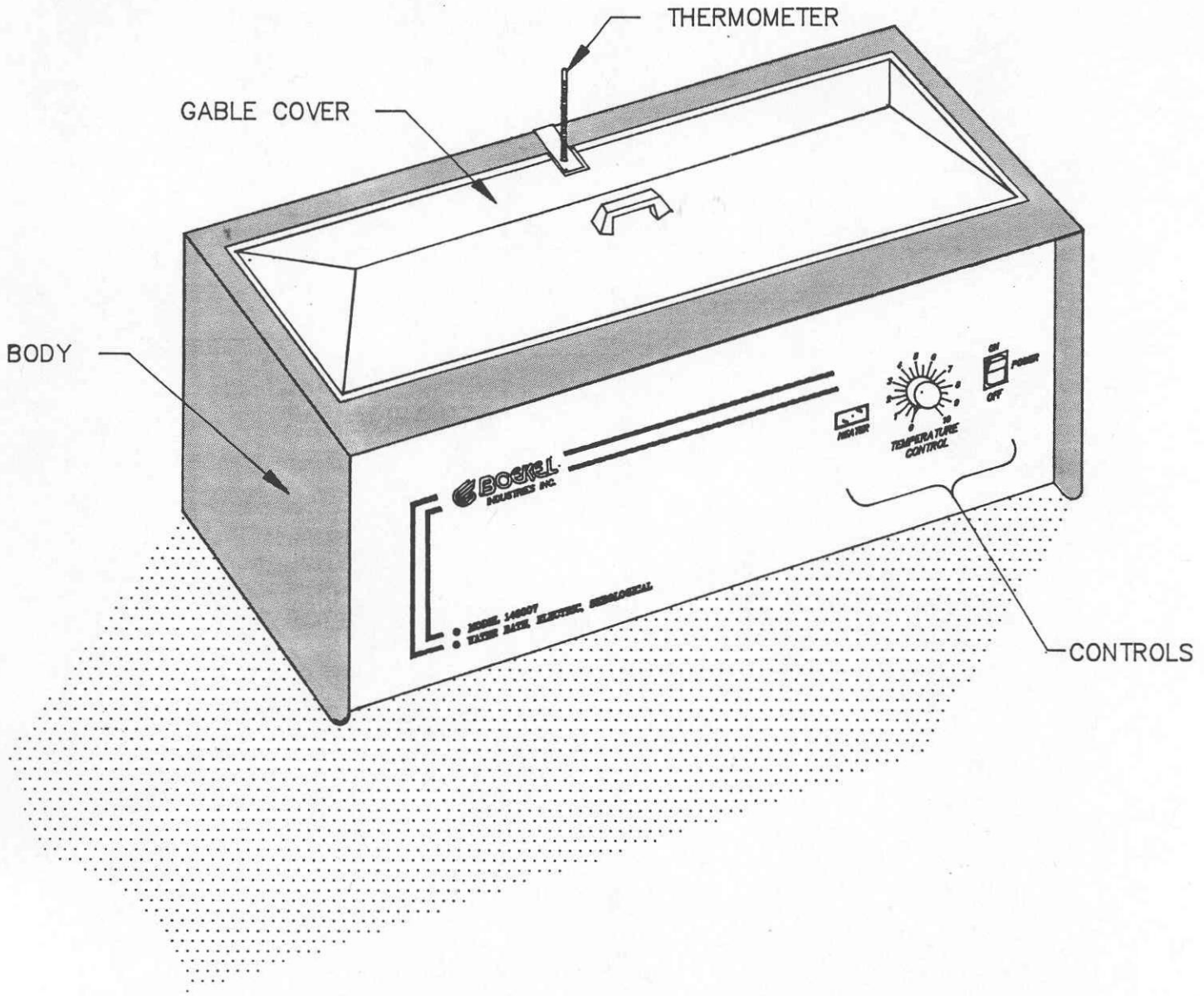
INSTRUCTION and MAINTENANCE MANUAL
SEROLOGICAL WATER BATH

MODEL #148007



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SEROLOGICAL WATER BATH
CATALOG NO. 148001

1. Introduction

It is important that these instructions be completely read and all operators acquainted with the units' operation before attempting to use it. Specific precautions will be noted together with maintenance requirements to insure safe and trouble-free operation. **DO NOT - UNDER ANY CIRCUMSTANCES - ALTER OR MODIFY THIS EQUIPMENT.** Such action will not only void the warranty but may create a hazardous condition leading to operator injury or equipment failure.

This water bath is intended to be used for a variety of serological procedures together with other laboratory applications including pharmaceutical, clinical and environmental work. It is designed to maintain bath temperature within ±0.5°C or less over an operating range from slightly above ambient to 100°C (with gable cover) or an upper temperature limit of approximately 55°C above ambient with the bath uncovered.

2. Equipment Description

The water bath body is constructed of stainless steel. It has been painted, both to enhance appearance and to provide an added measure of surface protection. The water chamber is also constructed of stainless steel.

Temperature control is achieved through the use of an adjustable hydraulic thermostat. A single control knob mounted on the front panel is the only adjustment required for achieving any desired temperature within the operating range. The entire unit is thermally insulated to minimize heat loss and to keep the exterior cool even when chamber temperature is at the boiling point. All units are provided with a mercury filled immersion type thermometer together with a stainless steel mounting bracket. This thermometer is of suitable temperature range to indicate all temperatures throughout the operating limits of the water bath.

It is recommended that the optional gable cover be used. The use of this cover will optimize temperature control while minimizing power consumption. This gable cover is constructed of stainless steel and has a handle for safe handling at high temperatures. It also has a cut-out at the center of the back edge to provide clearance for the thermometer and thermometer mounting bracket.

3. Specifications

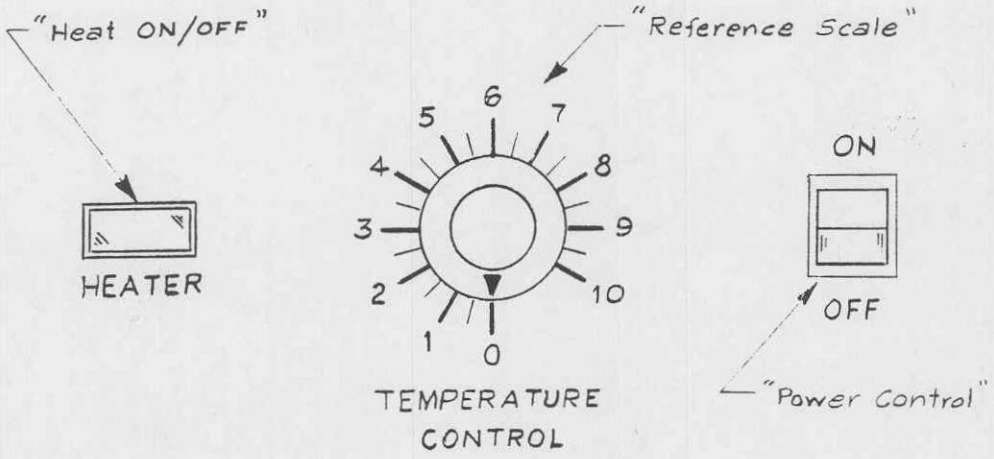
Dimensions, capacity and power requirements of the #148007 Serological Water Bath are listed below:

Maximum Bath Temp. (°C)	Without Cover With Cover	Amb. + 55 100
Water Chamber Size (Inches)	Length Width Depth	26 1/4 10 3/4 5 3/8
Exterior Size (Inches)	Length Width Depth	31 20 8
Normal Capacity	Gallons Liters	6.0 22.7
Net Weight Bath (lbs.) Net Weight Cover (lbs.) Shipping Weight, Bath + Cover (lbs.)		40 3 50
Maximum Power Required (Watts)		1500
Maximum Current (Amps)	* *	12.5 @ 120 Volts 6.25 @ 240 Volts

*Notes: 1. Units operate equally well at either 50 or 60Hz.
2. Units are factory wired for 120 V. operation. Conversion to 240 V. operation involves internal wiring modification (See Installation, Page 5).

4. Features and Controls

The entire operation of the water bath is dependent on only two simple controls together with an indicator light. All of these are located on the right side of the front panel and are illustrated below.



The Power Control Switch connects the unit to the power supply. This switch lights (amber) when in the "ON" position.

The Temperature Control Knob varies the thermostat set point. It has a graduated reference scale for correlation with bath temperature as indicated by the thermometer immersed in the bath. Note: The numbers on the reference scale do not represent actual temperatures but are useful for approximating set points. Actual bath temperature must be read directly from the immersion thermometer.

The Heater Light will glow (red) when the heaters are turned "ON". A regular cyclic period of alternate "ON" and "OFF" of this light indicates that temperature equilibrium is being maintained in the bath. A steady "ON" condition will be observed during the heat-up period from ambient temperature to the desired control temperature.

5. Installation

For best operating results, the water bath must be located on a level surface and in an area where ambient conditions are not subject to rapid changes.

It is recommended that distilled water be used at all times. This will minimize the build-up of sediment, foreign matter and corrosive factors which will harm the bath chamber.

CAUTION: NEVER CONNECT THE BATH TO A POWER SUPPLY UNLESS YOU ARE CERTAIN THAT IT IS OF THE PROPER VOLTAGE AND SUITABLY GROUNDED.

The water bath has been factory wired for operation with 120 V. power supply. If it is desired to operate with 240 V. power supply, a wiring change is required. This wiring change should be performed by qualified service personnel and in strict conformance with the following detailed instructions:

A. Being certain that the unit is disconnected from any power source, turn it upside down with its top surface resting on a soft surface such as cardboard or cloth to protect its finish.

B. Remove the bottom plate - being sure to retain the screw fasteners for later replacement.

C. Locate the terminal block which is mounted on a bracket at the edge of the internal partition and approximately in-line with the Heater Light (See Illustration #1).

D. Wiring for 120 V. operation is as shown on Illustration #1 - "A".

E. Wiring for 240 V. operation is as shown on Illustration #1 - "B".

F. To change from 120 V. to 240 V. operation:

(1) Loosen screws on terminals #1, #3 and #5.
(2) Remove the short jumper wire between terminals #1 and #3.
(3) Move wire from terminal #5 to terminal #3.
(4) Re-tighten all terminal screws, being certain that wire ends are fully inserted.

G. Replace bottom plate using same screws removed in step "B" above.

H. Turn unit right side up - it is now ready for operation from 240 Volt power source.

CAUTION: DO NOT, UNDER ANY CIRCUMSTANCES, CUT OR REMOVE THE THIRD (GROUND) PRONG FROM THE POWER CORD PLUG. DO NOT USE A TWO-PRONG ADAPTER PLUG.

6. Operating Instructions

CAUTION: NEVER OPERATE THE WATER BATH WITHOUT WATER IN THE CHAMBER. MAINTAIN A MINIMUM WATER DEPTH OF 3/4" TO PREVENT OVERHEATING AND POSSIBLE DAMAGE TO THE UNIT.

Before adding water to the chamber, be sure that the Power Cord is not plugged into a receptacle and that the Power Control Switch on the front panel is in the "OFF" position.

Add distilled water to the desired level, being sure to compensate for volume displaced by the items to be placed in the bath. Normal maximum depth is limited to within 1" of the top of the bath chamber.

Insert thermometer into mounting bracket provided. It must pass through both grommets on the bracket. Clamp bracket over back edge of the bath being careful to place it at the center (Left to Right) of the chamber. Adjust the thermometer vertically to place the sensing bulb at the proper depth in the chamber. Do not allow the bulb to touch the walls or bottom of the chamber.

CAUTION: CARE MUST BE TAKEN TO PREVENT ACCIDENTAL BREAKAGE OF THE THERMOMETER AND SPILLAGE OF CONTAINED MERCURY.

Place the gable cover carefully over the top of the bath chamber. This cover has a slot at the middle of its back edge to allow the thermometer and its bracket to pass through. It may require an adjustment of the bracket location if it was not initially located properly.

With the Power Control Switch in the "OFF" position and the Temperature Control Knob set at "0", the power cord may be plugged into a proper receptacle. The Power Control Switch should then be placed into the "ON" position and it will light (Amber) indicating that power is available.

Rotate the Temperature Control knob clockwise which raises the control temperature point. At a setting of approximately "3" on the reference scale, the Heater Light will come on (Red). This indicates that the heaters are now receiving power and the bath is being heated.

As previously described, the reference scale does not indicate bath temperature directly. To determine what temperatures may be expected from various scale values, select an arbitrary

setting such as "5" by turning the Temperature Control Knob clockwise from "0" to "5". The Heater Light will glow (Red) while the bath is heating. When the control temperature is reached, the Heater Light will go "ON" and "OFF" cyclically. The actual bath temperature should then be observed from the thermometer and recorded. This process should be repeated over a range of settings on the reference scale thereby determining an approximate relationship between scale reading and bath temperature - Note: for maximum repeatability of set points, always turn the Temperature Control knob in a clockwise direction.

It is important to be aware of the many variable factors which change the heat requirements of a water bath; thereby affecting its heat-up rate, control point temperature and accuracy in maintaining desired temperature. The first and most obvious factor is operator error. Inattention to test conditions will seriously detract from the performance of any laboratory instrument and the water bath is no exception.

Among the many significant factors are such things as: the amount of water placed in the bath, the number and type of samples in the bath, operation with or without a gable cover and changes of ambient temperature or air velocities. An often overlooked variable is the effect of changes in the line voltage supply. Since heat output is a function of the square of the voltage, small changes of the supply voltage can have a significant effect on the unit.

7. Equipment Care

The basic design and construction of the water bath reduces the regular care of the unit to one primary consideration - cleanliness.

Assuming no massive damage due to abuse or violation of previously explained operational safeguards, leaves only the implementation of good housekeeping methods to maintain the unit in top operating condition.

The interior of the bath and of the gable cover should be washed regularly with a mild detergent solution and rinsed with distilled water. The frequency of cleaning will be largely dependent on the frequency of use and upon the observed condition of the bath.

When not in use, the unit should be stored in a clean, dry condition - preferably with the cover on. The thermometer should be removed and carefully stored to prevent accidental breakage. The power cord should be unplugged and loosely coiled near the unit.

During operation, care should be used when placing articles into the bath or removing them after use. Although the bath is constructed of stainless steel, which is corrosion resistant, damage to its surface will create areas where corrosive attack is intensified.

8. Trouble-Shooting

There are very few malfunction problems with equipment such as this water bath. The lack of complexity and small number of working parts makes diagnosis and repair of problems easy. The observed problems and their probable causes are:

Problem	Causes
(a) Unit non-operative	(1) Not plugged in or plugged into improper outlet. (2) Power Switch in "OFF" position.
(b) Unit operative but does not heat.	(1) Temp. Control Knob set too low. (2) Faulty Thermostat. (3) Faulty Heater(s).
(c) Unit heats but at a reduced rate.	(1) Low line voltage. (2) Faulty heater(s).

9. Repair and Replacement

Repair of the water bath is confined to checking for loose electrical connections or replacement of faulty components. It is not recommended that repair of faulty components be attempted.

CAUTION: THE UNIT MUST BE DISCONNECTED FROM THE POWER SOURCE PRIOR TO SERVICING. IT IS RECOMMENDED THAT ALL SERVICE BE PERFORMED BY QUALIFIED PERSONNEL.

All repairs and parts replacements are done from the underside of the unit. It is necessary, therefore, to turn the unit upside down and remove the bottom cover as previously explained under "Installation", Steps A and B.

The first thing to check when a faulty component is suspected is the connecting wiring to that component. Look to see that all terminals are fully engaged and do not appear physically damaged or loosely attached. Refer to the wiring schematic to ensure that wire routing is correct. If no faults are detected, then replacement of the component is recommended. Specific instructions for the various components are as follows:

(See Illustration #2)

A. Power Switch (ON/OFF)

1. Depress four spring clips holding the switch in the panel and push the switch out through the opening in the panel without removing the wire connections.

2. Physically orient the new Switch to match the old one and change the wire connections from the old switch to the new one. Change one wire at a time being sure to connect it to its proper terminal on the new switch.

3. After all wiring connections are completed, depress the spring clips on the new switch and carefully insert it through the front panel until it snaps securely in place.

B. Heat Light (RED)

Replacement procedure is identical to that for the Power Switch except that only two wiring connections are required.

C. Temperature Control (Thermostat)

1. Remove Thermostat Bulb Mounting Clip by removing the nut and washer holding it in place. Carefully save clip, nut and washer for replacement.

2. Remove Temp. Selector Knob from front of thermostat by loosening two set screws which hold it on the thermostat shaft. Retain Knob for later replacement.

3. Remove two screws holding thermostat to the front panel and retain for replacement. (Note: These screws are normally hidden by the skirt on the Selector Knob).

4. Remove two wire connections from the terminals of the thermostat.

5. The thermostat should be moved away from the front panel until its shaft is completely inside the panel. The body of the thermostat, complete with its bulb and capillary, may now be removed.

6. Installation of the replacement thermostat should be done by reversing the procedure covered by steps 1 through 5.

CAUTION: CARE MUST BE TAKEN WHEN INSTALLING NEW "BULB" AND "CAPILLARY TUBE". NO SHARP BENDS OR CRIMPS ARE PERMITTED WHICH COULD PREVENT PROPER THERMOSTAT OPERATION. BE SURE, ALSO, TO ROUTE CAPILLARY AWAY FROM HEATERS SIMILAR TO ORIGINAL ARRANGEMENT OF OLD ASSEMBLY.

D. Heater(s)

To determine if a Heater needs to be replaced, check the integrity of the heating elements by measuring their resistance. Using an ohmmeter, read the total Heater resistance of each of the three Heaters. Disconnect the wiring connections to the Heater and with the ohmmeter connected to the leads "L" and "R", a value of approximately 115 ohms should be obtained. (When the Heaters are COLD).

If the heating elements are broken, an infinitely high resistance will be indicated. When this occurs, the Heater must be replaced as follows:

1. Remove all nuts and washers holding the Heater Plate and Heater to the bottom of the water bath chamber - Retain for later replacement.

2. Remove the Heater Plate and Heater. Retain the Plate and discard the Heater.

3. Apply a thin coat of thermal compound (approx. 1/16" thick) to the bottom face of a new Heater element.

4. Place the new Heater carefully over the studs on the bottom of the chamber, being certain that the terminals are located exactly as they were on the old heater.

5. Place the Heater Plate over the Heater and the studs. Hold it in place with the nuts and washers previously removed.

6. Re-connect the wire leads to their respective terminals on the new Heater.

10. Storage

Short term storage between periods of use has been covered under the "Equipment Care" section of these instructions.

For long-term storage, prior to initial use of the unit, it is recommended that it be kept in its original shipping container. This will provide the maximum protection possible.

If multiple units are to be stored at one location, the shipping containers may be stacked to a maximum height of four units.

Storage indoors is certainly preferred. If short term outdoor storage is unavoidable, protection must be provided against rain, snow and freezing temperatures.

11. Warranty

Boekel warrants products manufactured by Boekel to be free of defective material and workmanship for one year from the date of shipment by Boekel. The liability of Boekel for any defective equipment during the warranty period shall be limited to the repair of such equipment or replacement thereof without charge for parts or labor. Boekel shall be so liable only if Boekel receives written notice of such defect within thirty days after its discovery.

Buyer must return the defective product under warranty to Boekel after receipt of Boekel's specific permission to do so. This warranty does not extend to any Boekel product which has been subject to misuse, neglect, accident, modification or improper installation, or any product which has been repaired or altered by persons not expressly approved by Boekel. Boekel will not be liable for damages, loss or expense directly or indirectly arising from the use of the products or for any liability from their use either separately or in combination with other equipment or material or for any other cause.

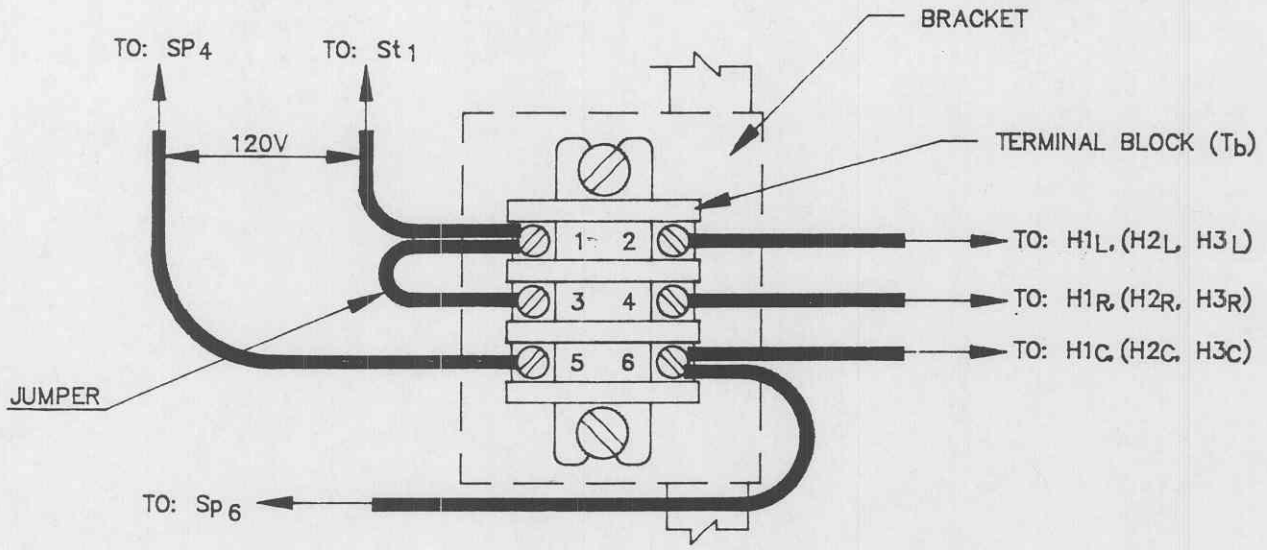
PARTS LIST

Description	Qty./Unit	Part Number	Symbol
1. Power Switch D.P.S.T	1	902-3196	Sp
2. Heater Light (Red)	1	902-2417	Lh
3. Thermostat	1	902-2450	St
4. Control Knob	1	926-3184	Ck
5. Heater, 120/240 V. 500 Watt	3	902-3197	H1,H2,H3
6. Bulb Bracket	1	10466	Bb
7. Plate, Heater	3	11093	Ph
8. Terminal Block	1	902-3198	Tb
9. Thermometer	1	905-2435	(N/A)
10. Bracket, Thermometer	1	11094	(N/A)
11. Grommet, Bracket	2	901-2523	(N/A)
12. Thermal Compound	A/R	934-2389	(N/A)

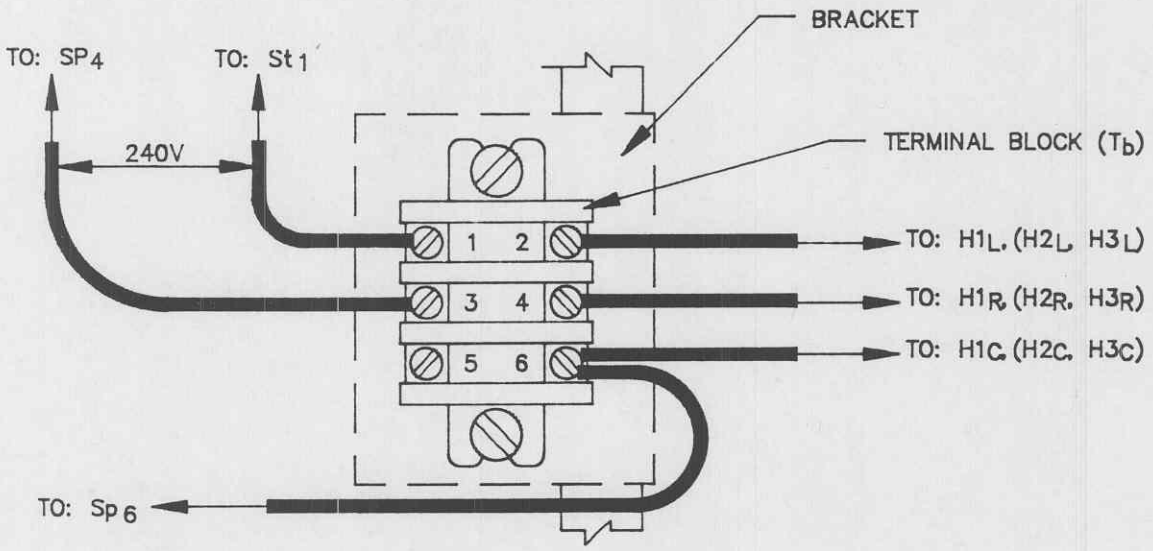
ACCESSORY LIST

A. Gable Cover	1	11095	(N/A)
B. Stainless Steel Racks			
(1) 20 Holes, 5/8" Dia. (10 1/8 x 2 x 4 3/8)	A/R	1392	(N/A)
(2) 21 Holes, 13/16 " Dia. (9 x 4 x 2 3/4)	A/R	1398	(N/A)
(3) 30 Holes, 9/16" Dia. (11 1/2 x 3 x 2 3/4)	A/R	1401C	(N/A)

CONNECTION DIAGRAM
120/240 VOLT

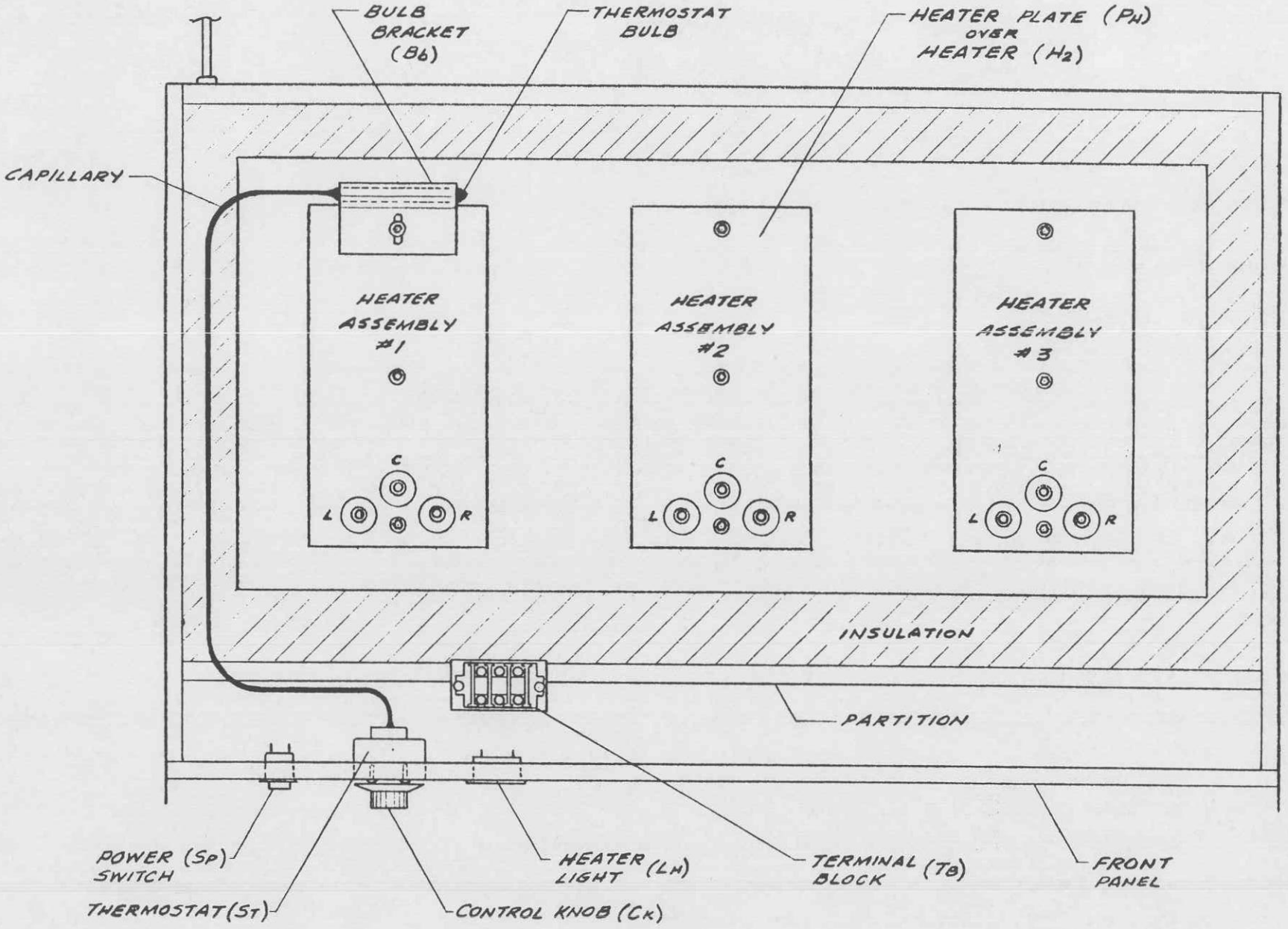


"A", 120 VOLT WIRING



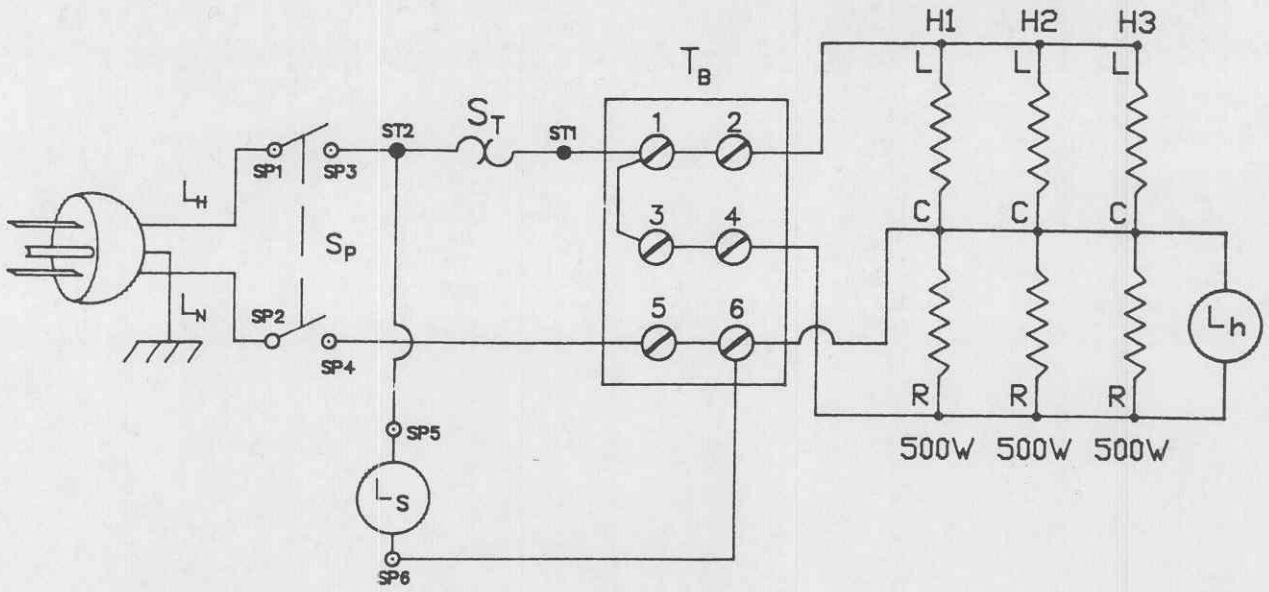
"B", 240 VOLT WIRING

ILLUSTRATION #1

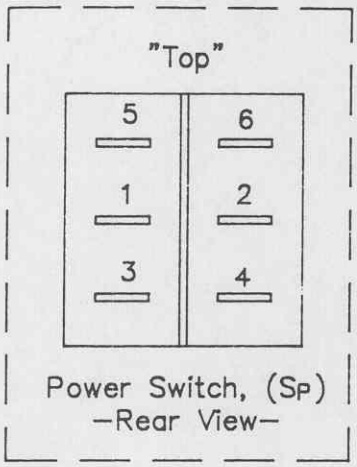


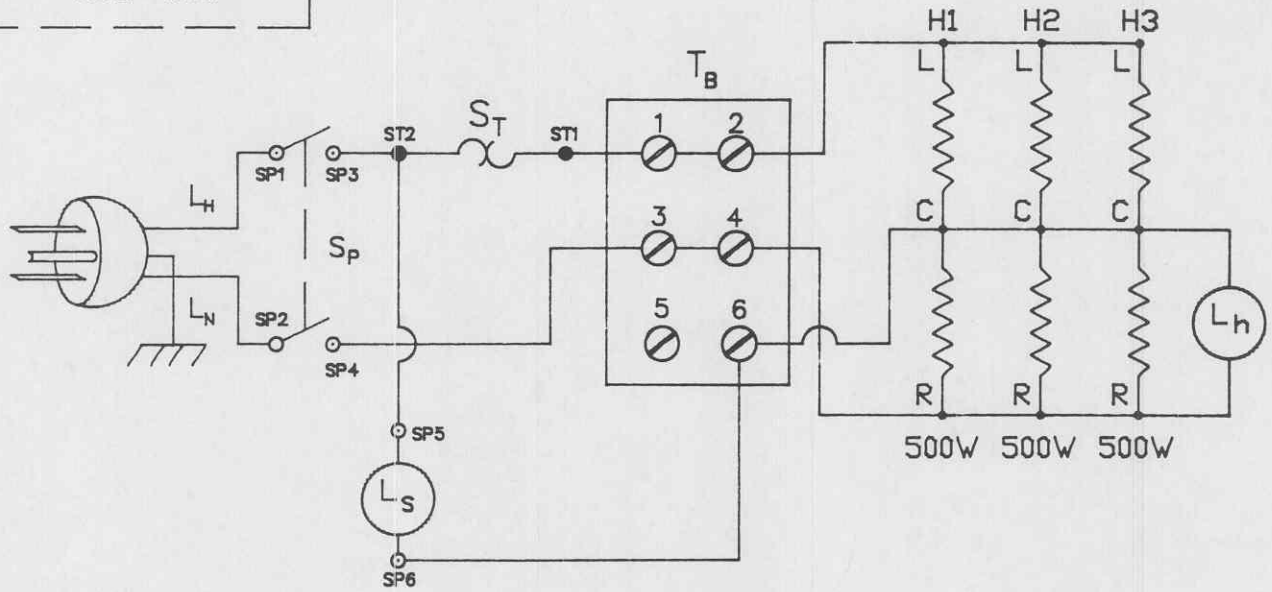
BOTTOM VIEW (COVER REMOVED)

ILLUSTRATION #2



120 VOLT





240 VOLT

ILLUSTRATION #3